Subject Index to Volume 68

A

Acid-base imbalance
influence on amino acid excretion, 922
ACTH: *see* Adrenocorticotropic hormone
ACTH releasing factor: *see* Corticotropin-releasing factors
Adaptation, physiological
adaptations for cold hardiness in freeze-tolerant animals, 67–73
membrane adaptations, 68–70
mitochondrial adaptations, 72–73
protein adaptations, 70–72
solute changes in cold hardening, 73
adaptive strategies for freeze tolerance in marine invertebrates, 33–34
adaptive strategies for freeze tolerance in terrestrially hibernating frogs, 36–37
role in regulation of gastrointestinal mucosal growth, 490–492
Adenocarcinoma
human colonic adenocarcinoma cell line (HT-29), endocytosis of insulin receptors in, 1147
Adenosinetriphosphatase
Ca^{2+}-ATPase in labyrinth, 1091
H^+-translocating ATPase in chromaffin granules, 253–258
Na^+-K^+-ATPase in labyrinth, 1089-1091
Na^+-K^+-ATPase, role in secretion of endolymph, 1107–1108
Adenosine triphosphate
accumulation in transport of biogenic amines by chromaffin granules, 289–291
synthesis by oxidative phosphorylation, 177–231
ATP synthesis and hydrolysis on F_1, 198–212
coupling of $\Delta\tilde{\mu}_{H^+}$ to ATP synthesis, 212–217
general characteristics and structure of F_1F_0 type proton-ATPase, 185–192
H^+ conduction through F_0, 193–198
proton gradients in, 179–185
regulation of ATP synthesis/hydrolysis at level of F_1F_0, 217–219
Adenyl cyclase
in labyrinth, 1092–1093
Adipose tissue
adipocytes containing insulin receptors, endocytosis of, 1145–1147
adipocytes containing receptor-bound insulin, endocytosis of, 1136–1138
biochemical studies, 1137–1138
morphological studies, 1136–1137
adipocytes from other species, receptor-mediated degradation of insulin in, 1157–1158
adipocytes from rats, receptor-mediated degradation of insulin in, 1155–1157
Adrenocorticotropic hormone
history of, 744–747
production of, feedback control of, 766–780
characteristics of feedback inhibition, 768–769
distribution of glucocorticoid receptors, 776–777
early and late delayed-feedback inhibition, 772–774
evidence for, 766–768
fast (rate-sensitive)-feedback inhibition, 769–770
mechanisms underlying feedback inhibition, 777–780
nature of glucocorticoid receptors, 775–776
sites of early delayed-feedback inhibition, 774–775
sites of fast-feedback inhibition, 770–772
production of, neural control of, 759–766
afferent pathways to paraventricular nucleus, 762
location of CRF, vasopressin, and oxytocin neurons and their projections to median eminence, 759–762
neurotransmitter regulation of ACTH secretion, 763–766
pro-opiomelanocortin as precursor protein for, 756–759
biosynthetic studies, 756
peptides derived from POMC and their biological activities, 758–759
POMC gene and mRNA, 756–758
regulation of, factors involved in, 743–818

Afferent pathways
to paraventricular nucleus, role in neural control of ACTH/lipotropin production, 762
Aging
influence on structure and function of cartilage proteoglycans, 894–896
Alcohols
polyol cryoprotectants, metabolism in insects, 42–59
carbohydrate cryoprotectants, 43–44
enzymatic regulation of polyol biosynthesis, 47–52
molecular actions of cryoprotectants, 42–43
pathways of polyol biosynthesis, 44–45
provision of reducing equivalents and ATP, 46–47
regulation of cryoprotectant catabolism, 57–58
role of dual cryoprotectant systems, 58–59
triggering of polyol biosynthesis, 52–57
Aldosterone
regulation of Na^+ channels, 336–339
Amiloride
amiloride-blockable Na^+ channel, characteristics and regulatory mechanisms of, 309–373
amiloride channel interactions, 325–327
chemical properties and biological activities of amiloride, 324–325
hormonal control of Na^+ channels, 336–343
interaction of channels with cytoplasmic ions, 343–348
modulation of channels by luminal factors, 327–336
purification and biochemical characterization of Na^+ channel protein, 348–363
Amino acids
classification of, 914
excretion of, 917–925
influence of acid-base parameters, 922
influence of flow dynamics, 921
influence of glomerular filtration rate, 920–921
influence of hormones, 922–925
normal excretion, 919–920
physiological factors influencing excretion, 920–925
normal plasma concentrations of, 917–919
occurrence and chemistry of, 913–917
plasma amino acids, influence on glomerular filtration rate, 976–977
proximal tubular resorption of, kinetics of, 929–943
active transport, 931–932
apparent transport constants: maximum transport rate and half-saturation concentration, 932–938
internephron heterogeneity, 940–942
intracellular amino acid concentrations, 932
passive permeability of proximal tubule wall and luminal steady-state concentration, 938–940
reevaluation of constant maximal rate of tubular resorption concept, 942–943
saturation, 929–931
renal handling of, 911–1007
biochemical nature of resorption mechanisms, 955–957
generalized hyperaminoaciduria, 970–971
hyperaminoaciduria due to an overload, 968–969
hyperaminoaciduria in chronic renal failure, 971–972
pathophysiological aspects, 968–972
peritubular uptake, 949–950
renal hyperaminoacidurias, 969–970
secretion, 950–953
some aspects of interorgan transport and renal metabolism of amino acids, 972–976
specificity of different resorption systems, 959–967
stereospecificity of resorption mechanisms, 957–959
resorption along nephron, localization of, 925–929
internephron heterogeneity, 929
other nephron sections, 927–929
proximal convoluted tubule, 925–927
systemic and renal toxicity of, 978–980
transport in renal cell culture, 953–954
transport steps at subcellular level and driving forces of resorption, 943–949
peritubular exit of amino acids, 948–949
potassium and proton gradients as driving forces, 946–948
rheogenic sodium cotransport across brush border membrane, 943–944
sodium-independent and/or electroneutral brush border transport, 944–946

Aminoaciduria, renal
pathophysiological aspects, 968–972
generalized hyperaminoaciduria, 970–971
hyperaminoaciduria due to an overload, 968–969
hyperaminoaciduria in chronic renal failure, 971–972
renal hyperaminoacidurias, 969–970
Amphibia
charge movements in skeletal muscle of, 1207–1209
freeze-tolerant frogs, cryoprotectant metabolism in, 59–67
advantages of glucose as cryoprotectant in vertebrates, 65–66
control of glycolysis during cryoprotectant synthesis, 65
glucose homeostasis in vertebrates and its perturbation in frogs, 64–65
patterns of cryoprotectant accumulation and loss, 59–61
regulation of glucose synthesis in liver, 61–64
triggering, 61
terrestrially hibernating frogs, freeze tolerance in, 35–37
adaptive strategies for, 36–37
Animals, newborn
pulmonary surfactant in, 421–432
biochemical aspects, 421–424
hormonal regulation, 425–432
Anoxia
tolerance in frozen animals, 74–76
Antibodies
against carbohydrate components in cartilage proteoglycans, 882–884
against inhibin, use in methods for detection and estimation of inhibin, 566–568
against protein components in cartilage proteoglycans, 881–882
Anticancer drugs: *see* Antineoplastic agents
Antidiuretic hormone: *see* Vasopressin
Antineoplastic agents
drug-induced mutation, drug resistance, and tumor progression, 20–21
resistance to, genetic aspects of, 1–26
amplification of dihydrofolate reductase gene, 6–7
mechanisms of gene amplification, 12–15
membrane changes in multidrug resistance, 17–18
multidrug resistance and P-glycoprotein, 15–20
multidrug resistance phenotype, 15–17
rate of gene amplification, 9–11
stability of resistance due to gene amplification, 7–9
structure of amplified DHFR gene, 11–12
types of genetic changes occurring in resistance, 2–6
Apolipoproteins
apo A-I, 88–93
apo A-I cDNA, 90–91
apo A-I gene, 91–92, 113–115
apo A-I genetic variation, 92–93
apo A-II, 93–94
apo A-II cDNA, 93–94
apo A-II gene, 94, 112–113
apo A-IV, 94–95
apo A-IV cDNA, 95
apo A-IV gene, 95, 113–115
apo A-IV genetic variation, 95
apo B, 95–100
apo B cDNA, 97–98
apo B gene, 98, 113
apo B genetic variation, 98–100
apo CI, 101
apo CI cDNA and gene, 101, 115
apo CII, 101–103
apo CII cDNA, 102
apo CII gene structure, 102–103
apo CII genetic variation, 103
apo CIII, 103–105
apo CIII cDNA, 104
apo CIII gene, 104–105, 113–115
apo CIII genetic variation, 105
apo D, 105–106
apo D cDNA, 105–106
apo E, 106–112
apo E cDNA, 107
apo E gene structure, 107–108
apo E mutations, 108–112
gene family for, 116–117
gene rearrangments, 123–124
gene RFLPs associated with clinical phenotypes, 117–123
genes for, chromosomal location of, 112–115
chromosome 1: apo A-II, 112–113
chromosome 2: apo B, 113
chromosome 11: apo A-I, apo CIII, apo A-IV, 113–115
chromosome 19: apo E, apo CI, apo CII, 115
genetic variation and human disease, 85–132

Apoproteins
see also Apolipoproteins
apoprotein-based artificial surfactants in replacement therapy of neonatal respiratory distress syndrome, 438–439
composition of pulmonary surfactant, 379–384
hydrophobic surfactant apoproteins, 382–384
26- to 38-kDa surfactant apoproteins, 380–382
surfactant apoproteins, appearance in fetal lung, 424
Ascorbic acid
transport by chromaffin granules, role of cytochrome b_{561}, 286–289
ATP: *see* Adenosine triphosphate
ATPase: *see* Adenosinetriphosphatase
Atrial fibrillation
role of AV node in, 634–637
Atrial natriuretic factor: *see* Natriuretic peptides, atrial
Atrioventricular node
automaticity in, 633–634
conduction delay and block, site of, 623–624
conduction delay, causes of, 625–633
dual input and summation, 630–631
effects of neurotransmitters, 629–630
fiber diameter, 625
nature of inward current in AV nodal cells, 627–628
passive electrical properties, 626–627
reentry, 631–633
conduction delay, mechanism of, 624–625
decremental conduction vs. electrotonic transmission, 624–625
electrophysiology of, 616–623
AN, N, and NH zones, 618–621
anatomic and electrophysiological correlations, 621–623
pattern of excitation of node, 616–618
in mammals, morphology and electrophysiology of, 608–647
comparative aspects, 638–639
morphology of, 610–616
anatomic and electrophysiological correlations, 621–623
architecture of node, 612–613
atrial overlay fibers and bypass tracts, 614–615
AV nodal inputs, 615
different cell types within node, 610–612
histology, 613–614
P cells, 615
scarcity of intercellular contacts, 615–616
role in atrial fibrillation, 634–637
Axons
axon-associated adhesion molecules, 836–839
assays of function, 837–838
distribution, 838–839
structure, 836–837

B

Baroreceptors: *see* Receptors, sensory
Bile
role in regulation of gastrointestinal mucosal growth, 488
Biogenic amines
accumulation into chromaffin granules, model for hormone and neurotransmitter transport, 232–307
advantages of chromaffin granule as model for biogenic amine accumulation, 236
amine uptake in other neurosecretory vesicles, 292–293
ATP accumulation, 289–291
calcium transport, 291–292
chemiosmotic gradients and amine transport, 274–285
electrochemical proton gradient, 247–253
H^+-translocating ATPase, 253–258
ion permeability and regulation of volume, 245–247
methods for measurement of accumulation, 262–263
models for accumulation of biogenic amines, 258–262
physiological importance of biogenic amine transport, 236–237
properties of amine transport, 263–274
transport of ascorbate: role of cytochrome b_{561}, 286–289
Biological assay
in vitro methods for detection and estimation of inhibin, 563–568
dispersed pituitary cells, 564–566
incubated (hemi) pituitary glands, 563–564
Birds
photorefractoriness in, 133–176
causative role of prolactin, 159–162
causative role of thyroid hormones, 154–159

caused by changes in photoperiod-measuring system 145–146
caused by changes in sensitivity to negative feedback inhibition, 146–152
caused by direct inhibition of reproductive system, 154–162
caused by exhaustion of some component, 152–154
characteristics of photorefractoriness, 135–141
comparison of birds and mammals, 164–171
hypotheses regarding cause of photorefractoriness, 144–162
in juvenile birds, 163
onset of refractory state, 135–139
photoperiodic responses, 134–135
site of photorefractoriness, 141–144
termination of photorefractoriness, 139–141

Blood pressure
baroreflex sensitivity, effect of vasopressin on, 1266–1269
control of vasopressin release, 1249–1262
arterial baroreceptors, 1253–1254
atrial receptors, 1252–1253
mediation by atrial and arterial receptors, 1251–1262
relative role of atrial and arterial receptors, 1256–1262

Blood volume
control of vasopressin release, 1249–1262
arterial baroreceptors, 1253–1254
atrial receptors, 1252–1253
mediation by atrial and arterial receptors, 1251–1262
relative role of atrial and arterial receptors, 1256–1262

Body water
ice and water content in relation to freeze tolerance in animals, 37–40
ice content, 38–39
unfreezable water, 39–40
water content, 37–38

Bombesin
effects on gastrointestinal mucosal growth, 480

Brain
development, organization, and function of, need for new techniques in study of, 1285–1286

Brain stem
ascending projections to thalamic and cortical neurons, 665–670
brain stem reticular nuclei, 666–670
monoaminergic nuclei, 670
control of thalamocortical activation, pioneering studies, 655–657
reticular stimulation to mimic arousal in electrophysiological study of thalamocortical relations, 675–676

C

Calcium
calcium-dependent neural adhesion molecules, 833–836
developmental role, 835–836
structure and binding activities, 833–834
tissue distribution, 834
transport in chromaffin granules, 291–292

Carbohydrates
see also Oligosaccharides; Proteoglycans
carbohydrate cryoprotectants in insects, 43–44
components of cartilage proteoglycans, 860–868

Carbonic anhydrase
in labyrinth, 1091–1092

Cardiovascular system
see also Heart
actions of vasopressin on, 1262–1269
effect on baroreflex sensitivity, 1266–1269
role in cardiovascular regulation, 1273–1276
vasoconstrictor action, 1262–1264

Cartilage
proteoglycan monomers in, specific interaction with hyaluronic acid and link protein, 873–879
interaction of proteoglycan and hyaluronic acid, 874–876
structure of link protein and its interaction with proteoglycan and hyaluronic acid, 876–879
proteoglycan types in, 879–881
proteoglycans in, biomechanical properties of, 889–894
Donnan osmotic effects, 890–891
excluded volume effects, 891–892
viscoelastic effects, 892–894
proteoglycans in, biosynthesis of, 884–889
addition of glycosaminoglycan chains, 886–889
addition of *N*-linked oligosaccharide chains, 885–886

Cartilage (*continued*)
addition of *O*-linked oligosaccharide chains, 886
effects of osteoarthritis, 898
export and assembly of proteoglycan aggregates into extracellular matrix, 889
synthesis of link protein, 885
translation of proteoglycan core protein, 885
proteoglycans in, immunochemistry of, 881–884
antibodies against carbohydrate components, 882–884
antibodies against protein components, 881–882
immunolocalization of proteoglycans, 884
proteoglycans in, structure and function of, 858–910
carbohydrate component, 860–868
chondroitin sulfate-rich region of core protein, 871–873
effects of development and aging, 894–896
effects of osteoarthritis on proteoglycan biosynthesis, 898
effects of osteoarthritis on proteoglycan catabolism, 898–899
effects of osteoarthritis on proteoglycan composition, 896–898
glycosaminoglycans in, 860–864
hyaluronic acid-binding region of core protein, 869–870
influence of development, aging, and disease on, 894–900
keratan sulfate-rich region of core protein, 870–871
linkage of glycosaminoglycan to protein, 866–868
N- and *O*-linked oligosaccharide chains in, 864–866
possible effects on biomechanical role of changes in proteoglycan structure due to osteoarthritis, 899–900
proteoglycan core protein structure, 868–873
cDNA: *see* **DNA**
Cell adhesion
see also Cell adhesion molecules
contributions to neural cell recognition, 846–850
contact-dependent axonal retraction, 848–849
preferences and combinations, 846–847
regulation of cell interactions by membrane apposition, 849–850
mediation by oligosaccharides, 839–846
ganglioseries oligosaccharides, 845–846
globoseries oligosaccharides, 845
interactions involving lactosyl oligosaccharides, 842–845
mechanisms of saccharide recognition, 841–842
saccharide structures, 840–841
Cell adhesion molecules
axon-associated adhesion molecules, 836–839
assays of function, 837–838
distribution, 838–839
structure, 836–837
calcium-dependent neural adhesion molecules, 833–836
developmental role, 835–836
structure and binding activities, 833–834
tissue distribution, 834
identification of, 821–823
general adhesion assays, 821–822
immunocytochemical assays, 823
specific adhesion assays, 822–823
in nervous system, classification of, 823–824
in vertebrate neural development, 819–857
neural cell adhesion molecule, 824–833
binding function, 827–828
function in development, 830–833
genetics and evolution of, 827
glycosylation, 826
molecular model of, 829–830
nomenclature, 824–825
polypeptides, 825–826
Cell density
basis of methods for age-correlative separation of red cells, 505–509
Cell line
human colonic adenocarcinoma cell line (HT-29), endocytosis of insulin receptors in, 1147
human lymphoblastoid B-cell line (IM-9), endocytosis of insulin receptors in, 1148
human lymphoblastoid B-cell line (IM-9), endocytosis of receptor-bound insulin in, 1138–1139
human lymphoblastoid B-cell line (IM-9), receptor-mediated degradation of insulin in, 1159
Cell membrane
adaptations for cold hardiness in freeze-tolerant animals, 68–70

membrane changes in multiple resistance to anticancer drugs, 17–18
Cell recognition
mediation by oligosaccharides, 839–846
ganglioseries oligosaccharides, 845–846
globoseries oligosaccharides, 845
interactions involving lactosyl oligosaccharides, 842–845
mechanisms of saccharide recognition, 841–842
saccharide structures, 840–841
neural cell recognition, contributions of cell adhesion to, 846–850
contact-dependent axonal retraction, 848–849
preferences and combinations, 846–847
regulation of cell interactions by membrane apposition, 849–850
Cell separation
age-correlative separation of red cells, in vitro methods for, 505–512
methods based on differences in cell density, 505–509
methods based on differences in cell size, 510–512
methods based on differences in osmotic fragility, 509–510
methods based on differences in surface charge, 510
Cerebrospinal fluid
role in production of perilymph of scala tympani, 1099–1100
Chlorpromazine
effects on hypothalamo-pituitary-adrenal axis, 791
Cholecystokinin
effects on gastrointestinal mucosal growth, 474–478
physiological significance, 476–478
Chondroitin sulfate
rich region of proteoglycan core protein in cartilage, 871–873
Chromaffin granules
biogenic amine accumulation into, model for hormone and neurotransmitter transport, 232–307
advantages of chromaffin granule as model for biogenic amine accumulation, 236
amine uptake in other neurosecretory vesicles, 292–293
ATP accumulation, 289–291
calcium transport, 291–292
chemiosmotic gradients and amine transport, 274–285
electrochemical proton gradient, 247–253
H^+-translocating ATPase, 253–258
ion permeability and regulation of volume, 245–247
methods for measurement of accumulation, 262–263
models for accumulation of biogenic amines, 258–262
physiological importance of biogenic amine transport, 236–237
properties of amine transport, 263–274
transport of ascorbate: role of cytochrome b_{561}, 286–289
composition and structure of, 239–245
intragranular components, 244–245
lipids, 244
membrane proteins, 240–242
soluble proteins, 242–243
functional granules and ghosts, isolation of, 237–239
Chromosomes
location of apolipoprotein genes, 112–115
chromosome 1: apo A-II, 112–113
chromosome 2: apo B, 113
chromosome 11: apo A-I, apo CIII, apo A-IV, 113–115
chromosome 19: apo E, apo CI, apo CII, 115
Circadian rhythm
in functional activity of hypothalamo-pituitary-adrenal axis, 781–786, 790
Cochlea
see also Organ of Corti
active processes in, 1055–1057
and cochlear nonlinearity, 1062–1067
cellular basis in mammals, 1056–1057
cellular basis in nonmammals, 1056
otoacoustic emissions, 1055
pathological changes to, 1059–1062
morphology of, 1084–1087
scala media, 1087
scala tympani and scala vestibuli, 1085–1087
vestibule, 1087–1089
perilymphs of, production and composition, 1093–1100
perilymph of scala vestibuli and of scala tympani differ in composition, 1093–1095
perilymph of scala vestibuli and of scala tympani differ in origin, 1095–1096

Cochlea (*continued*)
production of perilymph of scala tympani: role of cerebrospinal fluid, 1099–1100
production of perilymph of scala vestibuli, 1096–1099
primary afferent neurons in, frequency selectivity of, 1014–1029
intensity dependence of tuning, 1020–1021
lability of primary afferent tuning, 1022–1027
other measures of primary afferent tuning, 1018–1019
pure tone tuning curves, 1014–1018
role of efferents in afferent tuning, 1027–1029
tonotopicity of cochlear output, 1019–1020
tuning in mammals, 1009–1082
mechanical resonance of hair bundles, 1044
mechanical resonance of organ of Corti, 1045–1051
static shifts of cochlear partition, 1044–1045
tuning in, origin of lability and intensity dependence of, 1057–1067
active process and cochlear nonlinearity, 1062–1067
changes in passive mechanical properties, 1058–1059
pathological changes to active process, 1059–1062
Cold
see also Cryoprotective agents; Freezing
chill injury in animals, 28–30
cold hardiness in freeze-tolerant animals, adaptations for, 67–73
membrane adaptations, 68–70
mitochondrial adaptations, 72–73
protein adaptations, 70–72
solute changes in cold hardening, 73
Colonic neoplasms
human colonic adenocarcinoma cell line (HT-29), endocytosis of insulin receptors in, 1147
Corticotropin: *see* Adrenocorticotropic hormone
Corticotropin-releasing factors
CRF-41 in placenta and its release into mother's, circulation, 795–796
nature and modes of action of, 748–756
interactions: priming, potentiation, desensitization, and downregulation, 753–755
CRF in extrahypothalamic tissues and in circulation, 755–756
CRF molecules, 748–750
mechanisms of action, 751–753
receptors, 750–751
Cortilymph: *see* Labyrinthine fluids
CRF: *see* Corticotropin-releasing factors
Cryoprotective agents
metabolism in freeze-tolerant frogs, 59–67
advantages of glucose as cryoprotectant in vertebrates, 65–66
control of glycolysis during cryoprotectant synthesis, 65
glucose homeostasis in vertebrates and its perturbation in frogs, 64–65
patterns of cryoprotectant accumulation and loss, 59–61
regulation of glucose synthesis in liver, 61–64
triggering, 61
metabolism in insects, 42–59
carbohydrate cryoprotectants, 43–44
enzymatic regulation of polyol biosynthesis, 47–52
molecular actions of cryoprotectants, 42–43
pathways of polyol biosynthesis, 44–45
provision of reducing equivalents and ATP, 46–47
regulation of cryoprotectant catabolism, 57–58
role of dual cryoprotectant systems, 58–59
triggering of polyol biosynthesis, 52–57
Cushing's syndrome
pathophysiology of, 796–800
Cytochrome *b*
cytochrome b_{561}, role in ascorbate transport by chromaffin granules, 286–289
Cytoplasm
cytoplasmic ions, interaction of Na^+ channels with, 343–348

D

Dihydrofolate dehydrogenase
gene for, amplification in development of resistance to anticancer drugs, 6–15
rate of amplification, 9–11
stability of resistance, 7–9
structure of amplified gene, 11–12
Diuretics
effects on endolymph secretion, 1109–1112

DNA
apolipoprotein A-I cDNA, 90–91
apolipoprotein A-II cDNA, 93–94
apolipoprotein A-IV cDNA, 95
apolipoprotein B cDNA, 97–98
apolipoprotein CI cDNA, 101
apolipoprotein CII cDNA, 102
apolipoprotein CIII cDNA, 104
apolipoprotein D cDNA, 105–106
apolipoprotein E cDNA, 107
Drug resistance
drug-induced mutation, drug resistance, and tumor progression, 20–21
to anticancer drugs, genetic aspects of, 1–26
amplification and evolutionary homology of P-glycoprotein, 18–20
amplification of dihydrofolate reductase gene, 6–7
mechanisms of gene amplification, 12–15
multidrug resistance and P-glycoprotein, 15–20
multidrug resistance phenotype, 15–17
rate of gene amplification, 9–11
stability of resistance due to gene amplification, 7–9
structure of ampiified DHFR gene, 11–12
types of genetic changes occurring in resistance, 2–6
Dyes
use in optical imaging of neuronal activity, 1285–1366
comparison of optical imaging with and without voltage-sensitive dyes, 1357–1358
design, synthesis, and evaluation of improved optical probes, 1352–1357
voltage-sensitive dyes for real-time imaging of activity in simple and complex systems, 1290–1327

E

Ear, internal: *see* Labyrinth
Endocytosis
of insulin receptors, 1143–1150
evaluation of methods, 1149
in adipocytes, 1145–1147
in human colonic adenocarcinoma cell line (HT-29), 1147
in human lymphoblastoid B-cell line (IM-9), 1148
in liver, 1143–1145
physiological significance of receptor endocytosis, 1148–1149
receptor phosphorylation as putative signal for endocytosis, 1148
of receptor-bound insulin, 1133–1143
evaluation of methods, 1141–1143
in adipocytes, 1136–1138
in human lymphoblastoid B-cell line (IM-9), 1138–1139
in liver, 1134–1136
in other cell types, 1139–1140
physiological significance of insulin endocytosis, 1140–1141
receptor-mediated endocytosis of insulin, 1129–1196
role in receptor-mediated insulin degradation, 1181–1182
Endolymph: *see* Labyrinthine fluids
Endorphins
effects on hypothalamo-pituitary-adrenal axis, 792
Endothelium, vascular
endothelium-derived relaxant factor, interaction with vasopressin, 1271–1272
Enteroglucagon
effects on gastrointestinal mucosal growth, 480–481
Epidermal growth factor-urogastrone
effects on gastrointestinal mucosal growth, 482–484
receptor-ligand system for, 1170–1174
Epithelium
epithelial Na^+ channels, ion permeation through, 311–323
channel density, 321–323
macroscopic properties of channels, 311–314
single Na^+ channel measurements, 314–321
Erythrocyte aging
age-correlative separation of red cells, in vitro methods for, 505–512
methods based on differences in cell density, 505–509
methods based on differences in cell size, 510–512
methods based on differences in osmotic fragility, 509–510
methods based on differences in surface charge, 510
experimental models and approaches in study of, 504–512
in vitro methods for age-correlative separation of red cells, 505–512
isolation of senescent cells in vivo, 512–514

Erythrocyte aging (*continued*)
problems and prospects for current practice, 515–520
hypotheses and relevant findings, 520–544
functional impairment of dense red cells, 520–527
influence of age of organism on red cell survival and properties of density-separated red cells, 543–544
potential mechanisms for red cell surface alterations, 534–543
surface changes on dense red cells, 527–534
progress and problems, 503–554
caveats for density-dependent separation, 517–520
definition of problem, 503–504
lack of adequate cell age-associated markers, 515–517
Extracellular matrix
export and assembly of proteoglycan aggregates into, 889

F

Feedback
control of production of ACTH/lipotropin, 766–780
characteristics of feedback inhibition, 768–769
distribution of glucocorticoid receptors, 776–777
early and late delayed-feedback inhibition, 772–774
evidence for, 766–768
fast (rate-sensitive)-feedback inhibition, 769–770
mechanisms underlying feedback inhibition, 777–780
nature of glucocorticoid receptors, 775–776
sites of early delayed-feedback inhibition, 774–775
sites of fast-feedback inhibition, 770–772
Feeding
influence on functional activity of hypothalamo-pituitary-adrenal axis, 786
Fertility
regulation by inhibin, significance of, 585–592
in adult female animals, 589–592
in adult male animals, 587–588
in prepubertal female animals, 588–589
in prepubertal male animals, 585–587
Fetus
pulmonary surfactant in, 421–432
appearance of surfactant apoproteins, 424
biochemical aspects, 421–424
content and composition of surfactant phospholipids during lung development, 431–422
developmental changes in surfactant lipid synthesis, 422–423
glycogen metabolism in perinatal lung, 423–424
hormonal regulation, 425–432
Folliculostatin: *see* Inhibin
Freezing
animals in frozen state, life functions in, 73–79
anoxia tolerance, 74–76
metabolic rate depression, 76–78
nuclear magnetic resonance analysis of metabolism in vivo, 78–79
cryopreservation of vertebrate organs, 66–67
freeze tolerance in animals, 27–84
adaptive strategies for freeze tolerance of marine invertebrates, 33–34
body ice content, 38–39
body unfreezable water, 39–40
body water content, 37–38
carbohydrate cryoprotectants, 43–44
chill and freezing injury, 28–30
cold hardening, 30
cryoprotectant metabolism in insects, 42–59
factors influencing freezing survival of marine invertebrates, 33
freeze avoidance, 31–32
freeze tolerance, 30–31
ice-nucleating proteins, 40
in insects, 34–35
in marine invertebrates, 32–34
in terrestrially hibernating frogs, 35–37
phylogeny of, 32–37
regulation of synthesis of ice-nucleating proteins, 41–42
thermal hysteresis proteins, 41
freeze-tolerant animals, adaptations for cold hardiness in, 67–73
membrane adaptations, 68–70
mitochondrial adaptations, 72–73
protein adaptations, 70–72
solute changes in cold hardening, 73

freeze-tolerant frogs, cryoprotectant metabolism in, 59–67
advantages of glucose as cryoprotectant in vertebrates, 65–66
control of glycolysis during cryoprotectant synthesis, 65
glucose homeostasis in vertebrates and its perturbation in frogs, 64–65
patterns of cryoprotectant accumulation and loss, 59–61
regulation of glucose synthesis in liver, 61–64
triggering, 61
Frogs: *see* Amphibia
FSH
suppression of, in direct in vivo method for detection of inhibin, 561–562

G

Gastrin
effects on gastrointestinal mucosal growth, 461–474
clinical significance, 471–474
physiological significance, 469–471
Gastrointestinal hormones
effects on gastrointestinal mucosal growth, 458–486
Gastrointestinal mucosa
growth of, characteristics, 457–458
growth of, regulation, 456–502
adaptation, 490–492
effects of bombesin, 480
effects of cholecystokinin, 474–478
effects of enteroglucagon-glucagon, 480–481
effects of epidermal growth factor, 482–484
effects of gastrin, 461–474
effects of gastrointestinal peptides, 458–486
effects of other peptides, 484
effects of polyamines, 492–494
effects of secretin, 478–479
effects of somatostatin, 479–480
luminal factors in, 486–489
role of local nutrition, 486–488
role of other luminal substances, 488–489
role of pancreatic and biliary secretions, 488
Gene amplification
and resistance to anticancer drugs, 6–15
amplification and evolutionary homology of P-glycoprotein, 18–20
amplification of dihydrofolate reductase gene, 6–7
mechanisms of amplification, 12–15
rate of amplification, 9–11
stability of resistance, 7–9
structure of amplified unit, 11–12
Genes
apolipoprotein A-I gene, 91–92
location on chromosome 11, 113–115
apolipoprotein A-II gene, 94
location on chromosome 1, 112–113
apolipoprotein A-IV gene, 95
location on chromosome 11, 113–115
apolipoprotein B gene, 98
location on chromosome 2, 113
apolipoprotein CI gene, 101
location on chromosome 19, 115
apolipoprotein CII gene structure, 102–103
location on chromosome 19, 115
apolipoprotein CIII gene, 104–105
location on chromosome 11, 113–115
apolipoprotein E gene structure, 107–108
location on chromosome 19, 115
apolipoprotein gene family, 116–117
apolipoprotein gene rearrangements, 123–124
apolipoprotein gene RFLPs associated with clinical phenotypes, 117–123
apolipoprotein genes, chromosomal location of, 112–115
chromosome 1: apo A-II, 112–113
chromosome 2: apo B, 113
chromosome 11: apo A-I, apo CIII, apo A-IV, 113–115
chromosome 19: apo E, apo CI, apo CII, 115
pro-opiomelanocortin gene and mRNA, 756–758
Genetic diversity: *see* Variation (genetics)
Genetics
see also Polymorphism (genetics); Variation (genetics)
aspects of resistance to anticancer drugs, 1–26
amplification and evolutionary homology of P-glycoprotein, 18–20
gene amplification and drug resistance, 6–15
membrane changes in multidrug resistance, 17–18
multidrug resistance and P-glycoprotein, 15–20
multidrug resistance phenotype, 15–17

Genetics (*continued*)
types of genetic changes occurring in resistance, 2–6
Glomerular filtration rate
influence of plasma amino acids on, 976–977
influence on amino acid excretion, 920–921
Glucagon
effects on gastrointestinal mucosal growth, 480–481
Glucocorticoids
see also Receptors, glucocorticoid
effect on maturation of fetal lung, 425–428
Glucose
advantages as cryoprotectant in vertebrates, 65–66
cryoprotectant glucose homeostasis in vertebrates and its perturbation in frogs, 64–65
cryoprotectant glucose synthesis in liver of freeze-tolerant frogs, regulation of, 61–64
Glutathione
renal handling of, 983–986
Glycogen
metabolism in perinatal lung, 423–424
Glycolysis
control during cryoprotectant biosynthesis in freeze-tolerant frogs, 65
P-Glycoprotein *see* Membrane glycoproteins
Glycoproteins
see also Membrane glycoproteins
asialo-(galactose terminal) glycoproteins, receptor-ligand system for, 1176–1178
Glycosaminoglycans
chains of, addition in biosynthesis of cartilage proteoglycans, 886–889
in cartilage proteoglycans, 860–864
linkage to protein in cartilage proteoglycans, 866–868
Glycosylation
of neural cell adhesion molecule, 826
Growth
influence on structure and function of cartilage proteoglycans, 894–896
Growth hormone: *see* Somatotropin

H

Hair cells
receptor potentials of, general aspects, 1029–1036
electrical filtering in hair cell tuning, 1039–1040
gating of K^+ transduction current, 1030–1031
hair cell transfer curve and AC and DC receptor potentials, 1032
history, 1030
neural responses at low frequencies, 1034–1036
production of AC and DC receptor potentials at low frequencies, 1032–1033
terminology, 1029
velocity of displacement drive to hair bundles, 1033–1034
tuning of, features of, 1036–1039
extracellular measures of hair cell tuning, 1038–1039
hair cell tuning in the apex, 1038
hair cell tuning in the base, 1036–1038
tuning of, mechanisms of, 1039–1043
electrical filtering of receptor potentials, 1039–1040
is electrical resonance present in mammalian hair cells? 1041–1043
voltage-controlled channels in hair cells, 1040
Heart
see also Atrioventricular node
effects of vasopressin on, 1264–1266
Heart block
AV conduction delay and block, site of, 623–624
Homeostasis
cryoprotectant glucose homeostasis in vertebrates and its perturbation in frogs, 64–65
liquid homeostasis in pulmonary alveoli, role of pulmonary surfactant in, 409–411
Hormones
see also Gastrointestinal hormones; Sex hormones; Thyroid hormones
influence on amino acid excretion, 922–925
Hyaluronic acid
hyaluronic acid-binding region of proteoglycan core protein in cartilage, 869–870
specific interaction of proteoglycan monomers in cartilage with, 873–879
interaction of proteoglycan and hyaluronic acid, 874–876
structure of link protein and its interaction with proteoglycan and hyaluronic acid, 876–879

Hyperlipoproteinemia
clinical phenotypes of, apolipoprotein gene RFLPs associated with, 117–123
Hypothalamo-pituitary-adrenal axis
functional activity of, changes in, 780–786
circadian rhythm, 781–786
feeding, 786
stress response, 780–781
ontogeny of, 786–790
capacity of axis components to synthesize and secrete hormones, 787–789
circadian rhythm, 790
stress response, 789–790
pharmacology of, 790–792
chlorpromazine, 791
opioids, 792
reserpine, 790–791
role in pregnancy and parturition, 792–795
Hypothalamus
see also Hypothalamo-pituitary-adrenal axis; Paraventricular hypothalmic nucleus
as site of early delayed-feedback inhibition of ACTH/lipotropin production, 774–775
as site of fast-feedback inhibition of ACTH/lipotropin production, 771

I

Ice
body ice content in relation to freeze tolerance in animals, 38–39
ice-nucleating proteins in freeze tolerance in animals, 40, 41–42
regulation of synthesis of, 41–42
Immunochemistry
of cartilage proteoglycans, 881–884
antibodies against carbohydrate components, 882–884
antibodies against protein components, 881–882
immunolocalization of proteoglycans, 884
Immunoglobulin A
polymeric immunoglobulin A receptor-ligand system, 1169–1170
Immunologic techniques
for detection and estimation of inhibin, 566–568
Infant, newborn
pulmonary surfactant in, 421–432
biochemical aspects, 421–424
hormonal regulation, 425–432
respiratory distress syndrome, surfactant replacement in, 432–439
Inhibin
detection and estimation of, methods for, 560–568
direct methods, based on suppression of FSH, 561–562
dispersed pituitary cells, 564–566
immunologic methods and antibodies against inhibin, 566–568
in vitro bioassay methods, 563–566
in vivo methods, 560–562
incubated (hemi)pituitary glands, 563–564
indirect methods, based on decrease of organ weights, 560–561
effects and mechanism of action of, 582–585
effects on pituitary gland, 582–583
extrapituitary effects, 583–585
historical background on, 557–560
production of, regulation of, 573–577
in vitro experiments, 574–577
in vivo experiments, 573
purification and physiochemical characteristics of, 577–582
gonadal inhibin, 578–579
peptides with inhibinlike activity, isolated from seminal plasma, 580–582
structural relationships between gonadal inhibin and other regulatory proteins, 579–580
regulation of fertility, significance of, 585–592
in adult female animals, 589–592
in adult male animals, 587–588
in prepubertal female animals, 588–589
in prepubertal male animals, 585–587
sources and origin of, 568–577
ovaries and ovarian fluids, 571–572
placenta, 572–573
presence in tissue extracts and body fluids, 568–573
seminal fluid and prostate, 570–571
testis and testicular fluids, 569–570
survey of, 555–607
Inner ear fluids: *see* Labyrinthine fluids
Insects
cryoprotectant metabolism in, 42–59
carbohydrate cryoprotectants, 43–44

Insects (*continued*)
enzymatic regulation of polyol biosynthesis, 47–52
molecular actions of cryoprotectants, 42–43
pathways of polyol biosynthesis, 44–45
provision of reducing equivalents and ATP, 46–47
regulation of cryoprotectant catabolism, 57–58
role of dual cryoprotectant systems, 58–59
triggering of polyol biosynthesis, 52–57
freeze tolerance in, 34–35, 42–59
critical elements of, 35
Insulin
binding and uptake of, kinetics of, 1132–1133
effect on maturation of fetal lung, 431–432
influence on insulin receptor turnover, 1150–1154
insulin-induced change in receptor distribution without downregulation, 1151–1152
insulin-induced downregulation, 1152–1154
situations without insulin-induced changes in receptor concentration, 1150
insulin-degrading enzymes, 1166–1167
glutathione-insulin transhydrogenase, 1166
insulin protease, 1166–1167
receptor-bound insulin, endocytosis of, 1133–1143
evaluation of methods, 1141–1143
in adipocytes, 1136–1138
in human lymphoblastoid B-cell line (IM-9), 1138–1139
in liver, 1134–1136
in other cell types, 1139–1140
physiological significance of insulin endocytosis, 1140–1141
receptor-mediated degradation of, 1155–1168
evaluation of methods, 1168
hypothetical model for, 1182–1183
in adipocytes from other species, 1157–1158
in human lymphoblastoid B-cell line (IM-9), 1159
in other cell types, 1159
in rat adiopocytes, 1155–1157
in rat liver, 1155
inhibition of degradation, 1159–1164
insulin-degrading enzymes, 1166–1167
intermediary degradation products, 1164–1166
physiological significance of, 1167–1168
role of endocytosis in, 1181–1182
Invertebrates
see also Insects
marine invertebrates, freeze tolerance in, 32–34
adaptive strategies for freeze tolerance in marine environment, 33–34
factors influencing freezing survival, 33
Ion channels
amiloride-blockable Na^+ channel, characteristics and regulatory mechanisms of, 309–373
amiloride channel interactions, 325–327
chemical properties and biological activities of amiloride, 324–325
hormonal control of Na^+ channels, 336–343
interaction of channels with cytoplasmic ions, 343–348
modulation of channels by luminal factors, 327–336
purification and biochemical characterization of Na^+ channel protein, 348–363
epithelial Na^+ channels, ion permeation through, 311–323
channel density, 321–323
macroscopic properties of channels, 311–314
single Na^+ channel measurements, 314–321

K

Keratan sulfate
rich region of proteoglycan core protein in cartilage, 870–871
Kidney
amino acid resorption along nephron, localization of, 925–929
internephron heterogeneity, 929
other nephron sections, 927–929
proximal convoluted tubule, 925–927
amino acid transport steps at subcellular level and driving forces of resorption, 943–949
peritubular exit of amino acids, 948–949
potassium and proton gradients as driving forces, 946–948

rheogenic sodium cotransport across brush border membrane, 943–944
sodium-independent and/or electroneutral brush border transport 944–946
cultured cells, amino acid transport in, 953–954
handling of amino acids, 911–1007
biochemical nature of resorption mechanisms, 955–957
generalized hyperaminoaciduria, 970–971
hyperaminoaciduria due to an overload, 968–969
hyperaminoaciduria in chronic renal failure, 971–972
influence of acid-base parameters, 922
influence of flow dynamics, 921
influence of glomerular filtration rate, 920–921
influence of hormones, 922–925
normal excretion, 919–920
pathophysiological aspects, 968–972
peritubular uptake, 949–950
physiological factors influencing excretion, 920–925
renal hyperaminoacidurias, 969–970
secretion, 950–953
some asepects of interorgan transport and renal metabolism of amino acids, 972–976
specificity of different resorption systems, 959–967
stereospecificity of resorption mechanisms, 957–959
handling of oligopeptides, 980–989
glutathione and other γ-glutamyl peptides, 983–986
preresorptive hydrolysis in tubule lumen, 980–983
tubular resorption of intact peptides, 986–989
proximal tubular amino acid resorption, kinetics of, 929–943
active transport, 931–932
apparent transport constants: maximum transport rate and half-saturation concentration, 932–938
internephron heterogeneity, 940–942
intracellular amino acid concentrations, 932
passive permeability of proximal tubule wall and luminal steady-state concentration, 938–940
reevaluation of constant maximal rate of tubular resorption concept, 942–943
saturation, 929–931
toxicity of amino acids for, 978–980
Kidney failure, chronic
hyperaminoaciduria in, 971–972
Kinases: *see* Phosphotransferases, ATP

L

Labor
role of hypothalamo-pituitary-adrenal axis in, 792–795
Labyrinth
see also Cochlea
morphology localization of enzyme activities, 1084–1093
adenylate cyclase, 1092–1093
Ca^{2+}-adenosinetriphosphatase, 1091
carbonic anhydrase, 1091–1092
Na^+-K^+-adenosinetriphosphatase, 1089–1091
Labyrinthine fluids
endolymph, electrochemical composition of, 1100–1105
chemical composition of endolymph, 1100–1104
endolymphatic transepithelial potential, 1104–1105
endolymph, production of, 1100–1117, 1119–11120
perilymphatic origin of endolymph, 1105–1107
endolymph, secretion of, 1107–1117
effects of agents that affect ionic permeabilities, 1112–1114
effects of diuretics, 1109–1112
effects of ionic substitutions on transepithelial potential, 1108–1109
mechanisms of secretion, 1114–1117
role of Na^+-K^+-activated ATPase, 1107–1108
fluids surrounding sensory cells, production of, 1117–1118
cortilymph, 1117
subtectorial lymph, 1117–1118
perilymphatic origin of endolymph, 1105–1107
evidence for perilymphatic origin of endolymph, 1106–1107
possible origins of endolymph, 1105–1106

Labyrinthine fluids (*continued*)
perilymphs, production of, 1093–1100
composition and possible origins of perilymphs, 1093–1096
origin of, 1118–1119
perilymph is not a plasma ultrafiltrate, 1093
perilymph of scala vestibuli and of scala tympani differ in composition, 1093–1095
perilymph of scala vestibuli and of scala tympani differ in origin, 1095–1096
production of perilymph of scala tympani: role of cerebrospinal fluid, 1099–1100
production of perilymph of scala vestibuli, 1096–1099
Leukotriene D_4
interactions of vasopressin with, 1271
Light
photorefractoriness in birds, 133–176
causative role of prolactin, 159–162
causative role of thyroid hormones, 154–159
caused by changes in photoperiod-measuring system, 145–146
caused by changes in sensitivity to negative feedback inhibition, 146–152
caused by direct inhibition of reproductive system, 154–162
caused by exhaustion of some component, 152–154
characteristics of photorefractoriness, 135–141
comparison of birds and mammals, 164–171
hypotheses regarding cause of photorefractoriness, 144–162
in juvenile birds, 163
onset of refractory state, 135–139
photoperiodic responses, 134–135
site of photorefractoriness, 141–144
termination of photorefractoriness, 139–141
Lipids
composition of pulmonary surfactant, 378–379
content and composition of surfactant phospholipids during lung development, 421–422
in chromaffin granules, 244
surfactant lipids, biosynthesis of, 388–395
developmental changes in, 422–423
formation of other surfactant lipids, 393–394
phosphatidylcholine formation, 389–393
regulation of synthesis, 394–395
required substrates, 388
Lipotropin
production of, feedback control of, 766–780
characteristics of feedback inhibition, 768–769
distribution of glucocorticoid receptors, 776–777
early and late delayed-feedback inhibition, 772–774
evidence for, 766–768
fast (rate-sensitive)-feedback inhibition, 769–770
mechanisms underlying feedback inhibition, 777–780
nature of glucocorticoid receptors, 775–776
sites of early delayed-feedback inhibition, 774–775
sites of fast-feedback inhibition, 770–772
production of, neural control of, 759–766
afferent pathways to paraventricular nucleus, 762
location of CRF, vasopressin, and oxytocin neurons and their projections to median eminence, 759–762
neurotransmitter regulation of ACTH secretion, 763–766
pro-opiomelanocortin as precursor protein for, 756–759
biosynthetic studies, 756
peptides derived from POMC and their biological activities, 758–759
POMC gene and mRNA, 756–758
regulation of, factors involved in, 743–818
β-Lipotropin: *see* Lipotropin
Liver
insulin receptors in, endocytosis of, 1143–1145
receptor-bound insulin in, endocytosis of, 1134–1136
biochemical studies, 1135–1136
morphological studies, 1134–1135
receptor-mediated degradation of insulin in rat, 1155
synthesis of cryoprotectant glucose in freeze-tolerant frogs, 61–64
Lung
see also Pulmonary alveoli
defense system of, role of pulmonary surfactant in, 417–421

interaction with alveolar macrophages, 417–420
interaction with lymphocytes, 420
role in alveolar clearance, 420–421
mechanics of, role of pulmonary surfactant in, 413–417
Lymphocytes
interaction with pulmonary surfactant in pulmonary defense system, 420
B Lymphocytes
human lymphoblastoid B-cell line (IM-9), endocytosis of insulin receptors in, 1148
human lymphoblastoid B-cell line (IM-9), endocytosis of receptor-bound insulin in, 1138–1139
human lymphoblastoid B-cell line (IM-9), receptor-mediated degradation of insulin in, 1159

M

α-Macroglobulins
α_2-Macroglobulin-protease complex, receptor-ligand system for, 1179–1180
Macrophages
alveolar, interaction with pulmonary surfactant in pulmonary defense system, 417–420
Mammals
atrioventricular node morphology and electrophysiology in, 608–647
comparative aspects, 638–639
cochlear tuning in, 1009–1082
photorefractoriness in, comparison with birds, 164–171
Membrane glycoproteins
P-glycoprotein, role in multiple resistance to anticancer drugs, 15–20
amplification and evolutionary homology of P-glycoprotein, 18–20
membrane changes in multidrug resistance, 17–18
multidrug resistance phenotype, 15–17
Membrane potentials
endolymphatic transepithelial potential, 1104–1105
effects of ionic substitutions on potential and on endolymph secretion, 1108–1109
hair cell receptor potentials, general aspects, 1029–1036
gating of K^+ transduction current, 1030–1031
hair cell transfer curve and AC and DC receptor potentials, 1032
history, 1030
neural responses at low frequencies, 1034–1036
production of AC and DC receptor potentials at low frequencies, 1032–1033
terminology, 1029
velocity or displacement drive to hair bundles, 1033–1034
Membrane proteins
see also Membrane glycoproteins
in chromaffin granules, 240–242
Metabolism
in animals in frozen state, in vivo analysis by nuclear magnetic resonance, 78–79
rate depression in animals in frozen state, 76–78
Mitochondria
adaptations for cold hardiness in freeze-tolerant animals, 72–73
Models, molecular
of neural cell adhesion molecule, 829–830
binding domain, 829–830
cytoplasmic domain, 830
polysialic acid-containing domain, 830
Morphine
effects on hypothalamo-pituitary-adrenal axis, 792
Muscle contraction
activation of skeletal muscle, 1197–1199
comparisons between nonlinear charge and physiological processes, 1227–1235
calcium release and contractile activation, 1230–1232
charge movements and calcium channel "gating" in arthropod muscle, 1234–1235
comparisons with optical signals monitoring myoplasmic calcium, 1233–1234
correlations between overall charge and mechanical activity, 1232–1233
models of triggering calcium release, 1227–1230
excitation-contraction coupling, implications of existence of charge movement components for, 1235–1238
activation and inactivation properties, 1235–1236
kinetic parallels, 1237–1238
possible relationships between calcium release and charge movements, 1236–1237

Muscle contraction (*continued*)
intramembrane charge movements in skeletal muscle, 1197–1247
Muscle, skeletal
charge movement components in, characterization of, 1221–1227
quantitative description of charge components, 1225–1227
separation of "off" tail components, 1224–1225
sequential and parallel systems, 1221–1222
shifts in voltage dependence of individual components, 1224
superposition of transients with varying prepulse potential, 1222–1224
dielectric properties of biological membranes, 1197–1207
assessment of nonlinear capacitative charge, 1205–1207
dielectric relaxation processes, 1203–1205
distribution of polar molecules in uniform fields, 1199–1203
existence of charge movement components for excitation-contraction coupling, implications of, 1235–1238
activation and inactivation properties, 1235–1236
kinetic parallels, 1237–1238
possible relationships between calcium release and charge movements, 1236–1237
intramembrane charge movements in, 1197–1247
basic experimental findings, 1207–1215
charge movements after prolonged depolarization, 1216–1217
components of nonlinear charge, 1215–1221
features of "charge I", 1217
in amphibian muscle, 1207–1209
in different muscle types, 1212
pharmacological properties of charge movement components, 1219–1221
physiological significance of, 1212–1215
resolution of charging components, 1217–1219
voltage-clamp procedures, 1210–1211
nonlinear charge and physiological processes in, comparisons between, 1227–1235
calcium release and contractile activation, 1230–1232
charge movements and calcium channel "gating" in arthropod muscle, 1234–1235
comparisons with optical signals monitoring myoplasmic calcium, 1233–1234
correlations between overall charge and mechanical activity, 1232–1233
models of triggering calcium release, 1227–1230
Mutation
apolipoprotein E mutations, 108–112
drug-induced mutation, drug resistance, and tumor progression, 20–21

N

Natriuretic peptides, atrial
interactions of vasopressin with, 1272
NCAM: *see* Cell adhesion molecules
Neoplasms
drug-induced mutation, drug resistance, and tumor progression, 20–21
Nephron: *see* Kidney
Nervous system
see also Sympathetic nervous system
cell adhesion molecules in, classification of, 823–824
neural cell recognition, contributions of cell adhesion to, 846–850
contact-dependent axonal retraction, 848–849
preferences and combinations, 846–847
regulation of cell interactions by membrane apposition, 849–850
Neural cell adhesion molecule: *see* Cell adhesion molecules
Neural conduction
atrioventricular nodal conduction delay and block, 623–633
causes of delay, 625–633
mechanism of delay, 624–625
site of, 623–624
Neural pathways
see also Afferent pathways; Thalamocortical pathways
to hypothalamus in early delayed-feedback inhibition of ACTH/lipotropin production, 774
to hypothalamus in fast-feedback inhibition of ACTH/lipotropin production, 770–771

Neurons
see also Axons; Synapses
intrinsic properties subserving oscillatory mode in thalamocortical neurons, 676–693
neuronal activity studied by optical imaging, 1285–1366
electrical properties of arborization of single cultured neurons, 1290–1298
in vitro studies using intrinsic signals, 1327–1328
investigation of neuroglial interactions, 1324–1327
investigation of single cells and neuronal networks in invertebrate ganglia, 1298–1303
optical imaging using intrinsic signals, 1327–1332
potential of optical imaging relative to current techniques, 1286–1288
principle of optical imaging using dyes, 1288–1290
real-time optical imaging of activity in simple and complex systems utilizing voltage-sensitive dyes, 1290–1327
studies of functional architecture of cortex in vivo using intrinsic signals, 1328–1332
studies of neuronal populations in vertebrate preparations in vitro, 1303–1311
studies of organization and interactions of neuronal populations in vivo, 1311–1324
technical aspects of optical measurements, 1332–1358
physiologically identified thalamic and cortical neurons, activities in study of thalamocortical relations, 674–675
substrates in thalamocortical systems, 657–662
local-circuit neurons, 659
reticular thalamic neurons, 659–660
synaptic organization of thalamic neurons, 660–662
thalamocortical neurons, 658–659
Neurons, afferent
primary neurons in cochlea, frequency selectivity of, 1014–1029
intensity dependence of tuning, 1020–1021
lability of primary afferent tuning, 1022–1027
other measures of primary afferent tuning, 1018–1019
pure tone tuning curves, 1014–1018
role of efferents in afferent tuning, 1027–1029
tonotopicity of cochlear output, 1019–1020
Neurons, efferent
role in primary afferent tuning in cochlea, 1027–1029
Neuroregulators
effects on atrioventricular node, 629–630
regulation of ACTH secretion, 763–766
in experimental animals, 763–764
in humans, 764–766
Nuclear magnetic resonance
analysis of metabolism in animals in frozen state, 78–79

O

Oligopeptides
renal handling of, 980–989
glutathione and other γ-glutamyl peptides, 983–986
preresorptive hydrolysis in tubule lumen, 980–983
tubular resorption of intact peptides, 986–989
Oligosaccharides
mediation of cell adhesion and recognition, 839–846
ganglioseries oligosaccharides, 845–846
globoseries oligosaccharides, 845
interactions involving lactosyl oligosaccharides, 842–845
mechanisms of saccharide recognition, 841–842
saccharide structures, 840–841
N- and *O*-linked oligosaccharide chains in cartilage proteoglycans, 864–866
N-linked oligosaccharide chains, addition in biosynthesis of cartilage proteoglycans, 885–886
O-linked oligosaccharide chains, addition in biosynthesis of cartilage proteoglycans, 886
Optics
optical imaging in study of neuronal activity, 1285–1366
electrical properties of arborization of single cultured neurons, 1290–1298
in vitro studies using intrinsic signals, 1327–1328
investigation of neuroglial interactions, 1324–1327

Optics (*continued*)
investigation of single cells and neuronal networks in invertebrate ganglia, 1298–1303
optical imaging using intrinsic signals, 1327–1332
potential of optical imaging relative to current techniques, 1286–1288
principle of optical imaging using dyes, 1288–1290
real-time optical imaging of activity in simple and complex systems utilizing voltage-sensitive dyes, 1290–1327
studies of functional architecture of cortex in vivo using intrinsic signals, 1328–1332
studies of neuronal populations in vertebrate preparations in vitro, 1303–1311
studies of organization and interactions of neuronal populations in vivo, 1311–1324
technical aspects of optical measurements, 1332–1358
Organ of Corti
see also Hair cells
mechanical resonance of, 1045–1051
early measures of partition tuning, 1046–1047
recent measures of partition tuning, 1048–1051
second filter concept, 1047–1048
partition vibration of, mathematical modeling of, 1051–1054
complex resonance of organ of Corti, 1053
need for an active process, 1053–1054
structure of, 1010–1014
absence of neural and electrical synaptic networks, 1013–1014
general aspects of receptor cell structure, 1012
innervation pattern, 1012–1013
introduction and gross anatomy, 1010–1012
Osmolar concentration
solute changes in cold hardening in freeze-tolerant animals, 73
Osmosis
Donnan osmotic effects of cartilage proteoglycans, 890–891
Osmotic fragility
basis of methods for age-correlative separation of red cells, 509–510
Osteoarthritis
effects on cartilage proteoglycans, 896–900
effects on proteoglycan biosynthesis, 898
effects on proteoglycan catabolism, 898–899
effects on proteoglycan composition, 896–898
possible effects on biomechanical role of changes in proteoglycan structure due to osteoarthritis, 899–900
Ovary
inhibin in, 571–572
purification and physicochemical characteristics of, 578–579
structural relationships between gonadal inhibin and other regulatory proteins, 579–580
Oxidative phosphorylation
ATP synthesis by, 177–231
ATP synthesis and hydrolysis on F_1, 198–212
coupling of $\Delta\tilde{\mu}_{H^+}$ to ATP synthesis, 212–217
general characteristics and structure of F_1F_0 type proton-ATPase, 185–192
H^+ conduction through F_0, 193–198
proton gradients in, 179–185
regulation of ATP synthesis/hydrolysis at level of F_1F_0, 217–219

P

Pancreatic juice
role in regulation of gastrointestinal mucosal growth, 488
Paraventricular hypothalamic nucleus
afferent pathways to, role in neural control of ACTH/lipotropin production, 762
Peptides
see also Oligopeptides
effects on gastrointestinal mucosal growth, 458–486
polypeptide structure of neural cell adhesion molecule, 825–826
Perilymph: *see* Labyrinthine fluids
Phosphorylation
of insulin receptor as putative signal for endocytosis, 1148
Phosphotransferases, ATP
F_1F_0 type proton-ATPase, general characteristics and structure of, 185–192
insulin receptor as a kinase, 1131–1132

Photoperiodicity: *see* Light
Pituitary gland
effects of inhibin on, 582–583
in vitro bioassay methods for detection and estimation of inhibin, 563–566
dispersed pituitary cells, 564–566
incubated (hemi)pituitary glands, 563–564
Pituitary gland, anterior
see also Hypothalamo-pituitary-adrenal axis
as site of early delayed-feedback inhibition of ACTH/lipotropin production, 775
as site of fast-feedback inhibition of ACTH/lipotropin production, 771–772
Placenta
corticotropin-releasing factor-41 in, release into mother's circulation, 795–796
inhibin in, 572–573
Polyamines
effects on gastrointestinal mucosal growth, 492–494
Polymorphism (genetics)
apolipoprotein gene RFLPs associated with clinical phenotypes, 117–123
Polyols: *see* Alcohols
Polypeptides: *see* Peptides
POMC: *see* Pro-opiomelanocortin
Potassium
K^+ transduction current in hair cells, gating of, 1030–1031
Pregnancy
release of placental corticotropin releasing factor 41 into mother's circulation, 795–796
role of hypothalamo-pituitary-adrenal axis in, 792–795
Pregnancy and diabetes
maternal diabetes, effect on maturation of fetal lung, 431–432
Preservation, biological
cryopreservation of vertebrate organs, 66–67
Prolactin
role in causing photorefractoriness in birds, 159–162
Pro-opiomelanocortin
as common precursor protein for ACTH/β-lipotropin, 756–759
biosynthetic studies, 756
peptides derived from POMC and their biological activities, 758–759
POMC gene and mRNA, 756–758
Prostaglandins
interactions of vasopressin with, 1271
Prostate
inhibin in, 570–571
Proteins
see also Apoproteins; Glycoproteins; Membrane proteins
cellular protein adaptations for cold hardiness in freeze-tolerant animals, 70–72
composition of pulmonary surfactant, 379–384
Na^+ channel protein, purification and biochemical characterization of, 348–363
antibodies against epithelial Na^+ channel protein, 360–362
isolation and purification of epithelial Na^+ channel protein, 348–354
subunit composition of epithelial Na^+ channels, 354–360
role in freeze tolerance in animals, 40–42
ice-nucleating proteins, 40
regulation of synthesis of ice-nucleating proteins, 41–42
thermal hysteresis proteins, 41
soluble proteins in chromaffin granules, 242–243
Proteoglycans
in cartilage, biomechanical properties of, 889–894
Donnan osmotic effects, 890–891
excluded volume effects, 891–892
viscoelastic effects, 892–894
in cartilage, biosynthesis of, 884–889
addition of glycosaminoglycan chains, 886–889
addition of *N*-linked oligosaccharide chains, 885–886
addition of *O*-linked oligosaccharide chains, 886
effects of osteoarthritis, 898
export and assembly of proteoglycan aggregates into extracellular matrix, 889
synthesis of link protein, 885
translation of proteoglycan core protein, 885
in cartilage, immunochemistry of, 881–884
antibodies against carbohydrate components, 882–884
antibodies against protein components, 881–882
immunolocalization of proteoglycans, 884
in cartilage, structure and function of, 858–910

Proteoglycans (*continued*)
carbohydrate component, 860–868
chondroitin sulfate-rich region of core protein, 871–873
effects of development and aging, 894–896
effects of osteoarthritis on proteoglycan biosynthesis, 898
effects of osteoarthritis on proteoglycan catabolism, 898–899
effects of osteoarthritis on proteoglycan composition, 896–898
glycosaminoglycans in, 860–864
hyaluronic acid-binding region of core protein, 869–870
influence of development, aging, and disease on, 894–900
keratin sulfate-rich region of core protein, 870–871
linkage of glycosaminoglycan to protein, 866–868
N- and *O*-linked oligosaccharide chains in, 864–866
possible effects on biomechanical role of changes in proteoglycan structure due to osteoarthritis, 899–900
proteoglycan core protein structure, 868–873
proteoglycan monomers in cartilage, specific interaction with hyaluronic acid and link protein, 873–879
interaction of proteoglycan and hyaluronic acid, 874–876
structure of link protein and its interaction with proteoglycan and hyaluronic acid, 876–879
types in cartilage, 879–881
Pulmonary alveoli
liquid homeostasis in, role of pulmonary surfactant in, 409–411
macrophages of, interaction with pulmonary surfactant in pulmonary defense system, 417–420
particle clearance in, role of pulmonary surfactant in, 420–421
permeability of, role of pulmonary surfactant in, 411–413
Pulmonary surfactant
composition of, 377–384
lipids, 378–379
proteins, 379–384
in perinatal period, 421–432
appearance of surfactant apoproteins, 424
biochemical aspects, 421–424
content and composition of surfactant phospholipids during lung development, 421–422
developmental changes in surfactant lipid synthesis, 422–423
glycogen metabolism in perinatal lung, 423–424
hormonal regulation, 425–432
metabolism of, 387–403
biosynthesis of surfactant lipids, 388–395
catabolism and recycling of surfactant, 400–403
intracellular processing and storage of surfactant, 396–398
secretion of surfactant, 398–400
morphological aspects of, 384–387
physicochemical aspects of, 403–409
in vitro models for studies of dynamic surface tension, 404–409
versatility of surfactant system, 403–404
physiological roles of, 409–421
role in alveolar liquid homeostasis, 409–411
role in pulmonary defense system, 417–421
surfactant and lung mechanics, 413–417
surfactant and lung permeability, 411–413
replacement in neonatal respiratory distress syndrome, 432–439
adverse effects of surfactant replacement, 437–438
apoprotein-based artificial surfactants, 438–439
composition and dosage of exogenous surfactants, 433–435
prophylaxis by surfactant treatment at birth, 436–437
randomized clinical trials of, 435–436
research on, milestones in history of, 375–377

R

Receptors, endogenous substances
see also Receptors, glucocorticoid; Receptors, insulin; Receptors, neurohumor
other receptor-ligand systems, 1169–1180
asialo-(galactose terminal) glycoproteins, 1176–1178
epidermal growth factor, 1170–1174
growth hormone, 1174–1176
α_2-macroglobulin-protease complex, 1179–1180

polymeric immunoglobulin A, 1169–1170
transferrin, 1169
Receptors, glucocorticoid
distribution of, 776–777
nature of, 775–776
Receptors, insulin
as a kinase, 1131–1132
endocytosis of, 1143–1150
evaluation of methods, 1149
in adipocytes, 1145–1147
in human colonic adenocarcinoma cell line (HT-29), 1147
in human lymphoblastoid B-cell line (IM-9), 1148
in liver, 1143–1145
physiological significance of receptor endocytosis, 1148–1149
receptor phosphorylation as putative signal for endocytosis, 1148
insulin binding and uptake, kinetics of, 1132–1133
mediation of insulin degradation, 1155–1168
evaluation of methods, 1168
hypothetical model for, 1182–1183
in adipocytes from other species, 1157–1158
in human lymphoblastoid B-cell line (IM-9), 1159
in other cell types, 1159
in rat adipocytes, 1155–1157
in rat liver, 1155
inhibition of degradation, 1159–1164
insulin-degrading enzymes, 1166–1167
intermediary degradation products, 1164–1166
physiological significance of, 1167–1168
role of endocytosis in, 1181–1182
receptor-bound insulin, endocytosis of, 1133–1143
evaluation of methods, 1141–1143
in adipocytes, 1136–1138
in human lymphoblastoid B-cell line (IM-9), 1138–1139
in liver, 1134–1136
in other cell types, 1139–1140
physiological significance of insulin endocytosis, 1140–1141
receptor-mediated endocytosis and degradation of insulin, 1129–1196
species and tissue differences for, 1133
structure of, 1131
turnover of, 1150–1155
changes in receptor concentration induced by other factors, 1154
evaluation of methods, 1154
insulin-induced changes in receptor distribution without downregulation, 1151–1152
insulin-induced downregulation, 115?–1154
situations without insulin-induced changes in receptor concentration, 1150
Receptors, neurohumoral
receptors for corticotropin-releasing factors, 750–751
Receptors, sensory
see also Hair cells
baroreflex sensitivity, effect of vasopressin on, 1266–1269
control of vasopressin release, 1249–1262
arterial baroreceptors, 1253–1254
atrial receptors, 1252–1253
other receptors, 1254–1256
receptors mediating control of blood volume and arterial pressure, 1251–1262
relative role of atrial and arterial receptors, 1256–1262
Red cell senescence: *see* Erythrocyte aging
Renin-angiotensin system
interactions of vasopressin with, 1270–1271
Reproduction
photorefractoriness in birds, 133–176
causative role of prolactin, 159–162
causative role of thyroid hormones, 154–159
caused by changes in photoperiod-measuring system, 145–146
caused by changes in sensitivity to negative feedback inhibition, 146–152
caused by direct inhibition of reproductive system, 154–162
caused by exhaustion of some component, 152–154
characteristics of photorefractoriness, 135–141
comparison of birds and mammals, 164–171
hypotheses regarding cause of photorefractoriness, 144–162
in juvenile birds, 163
onset of refractory state, 135–139
photoperiodic responses, 134–135
site of photorefractoriness, 141–144
termination of photorefractoriness, 139–141
Reserpine
effects on hypothalamo-pituitary-adrenal axis, 790–791

Respiratory distress syndrome
surfactant replacement in, 432–439
adverse effects of surfactant replacement, 437–438
apoprotein-based artificial surfactants, 438–439
composition and dosage of exogenous surfactants, 433–435
prophylaxis by surfactant treatment at birth, 436–437
randomized clinical trials of, 435–436
Restriction fragment length polymorphisms: *see* Polymorphism (genetics)
RFLPs: *see* Polymorphism (genetics)

S

Scala tympani: *see* Cochlea
Scala vestibuli: *see* Cochlea
Secretin
effects on gastrointestinal mucosal growth, 478–479
Semen
inhibin in, 570–571
peptides with inhibinlike activity isolated from semen, 580–582
Sex hormones
effect on maturation of fetal lung, 429–431
interactions of vasopressin with, 1272–1273
Sodium
amiloride-blockable Na^+ channel, characteristics and regulatory mechanisms of, 309–373
amiloride channel interactions, 325–327
chemical properties and biological activities of amiloride, 324–325
hormonal control of Na^+ channels, 336–343
interaction of channels with cytoplasmic ions, 343–348
modulation of channels by luminal factors, 327–336
purification and biochemical characterization of Na^+ channel protein, 348–363
epithelial Na^+ channels, ion permeation through, 311–323
channel density, 321–323
macroscopic properties of channels, 311–314
single Na^+ channel measurements, 314–321
Somatostatin
effects on gastrointestinal mucosal growth, 479–480
Somatotropin
receptor-ligand system for, 1174–1176
Stress
functional response of hypothalamo-pituitary-adrenal axis to, 780–781, 789–790
Subtectorial lymph: *see* Labyrinthine fluids
Surface properties
cell surface charge density as basis of methods for age-correlative separation of red cells, 510
Sympathetic nervous system
interactions of vasopressin with, 1269–1270
Synapses
networks coordinating oscillatory mode in thalamocortical neurons, 693–706
intrathalamic circuits, 694–703
reciprocal thalamocortical activities, 703–706
neural and electrical synaptic networks, absence in organ of Corti, 1013–1014

T

Testis
inhibin in, 569–570
Thalamocortical pathways
electrophysiological study of, experimental designs in, 671–676
activities of physiologically identified neurons, 674–675
electrographic variables of behavioral states, 672–674
mimicking arousal by brain stem reticular stimulation, 675–676
functional states and associated neuronal interplay in, 649–742
brain stem control of thalamocortical activation, 655–657
intracellular studies of thalamic networks, 653–655
pioneering steps in study of, 652–657
synchronization and desynchronization, 651–652
thalamic genesis of spindle oscillations, 652–653
morphological substrates of, 657–670
ascending projections from brain stem core, 665–670
brain stem reticular nuclei, 666–670

corticothalamic projections, 664–665
local-circuit neurons, 659
monoaminergic nuclei, 670
prevalent thalamic projection to cortical midlayers, 662–663
reticular thalamic neurons, 659–660
synaptic organization of thalamic neurons, 660–662
thalamic cell types, 657–662
thalamic projections to superficial cortical layers, 663–664
thalamocortical neurons, 658–659
thalamocortical reciprocal projections, 662–665
oscillatory mode in, 676–706, 723–724
intrinsic neuronal properties, 676–693
synaptic networks, 693–706
tonically activated (relay) mode in, 706–723, 724
background activity, 706–714
excitatory-inhibitory response sequence, 714–723
Thyroid hormones
effect on maturation of fetal lung, 428–429
role in causing photorefractoriness in birds, 154–159
Transferrin
receptor-ligand system for, 1169

V

Variation (genetics)
apolipoprotein A-I genetic variation, 92–93
apolipoprotein A-IV genetic variation, 95
apolipoprotein B genetic variation, 98–100
apolipoprotein CII genetic variation, 103
apolipoprotein CIII genetic variation, 105
Vasoconstriction
action of vasopressin, 1262–1264
Vasodilator agents
endothelium-derived relaxant factor, interaction with vasopressin, 1271–1272
Vasopressin
actions on cardiovascular system, 1262–1269
effect on baroreflex sensitivity, 1266–1269
effect on heart, 1264–1266
role in cardiovascular regulation, 1273–1276
vasoconstrictor action, 1262–1264
interactions with other systems, 1269–1273
atrial natriuretic factor, 1272
eicosanoids, 1271
endothelium-dependent relaxing factor, 1271–1272
gonadal steroid hormones, 1272–1273
renin-angiotensin system, 1270–1271
sympathetic nervous system, 1269–1270
regulation of Na^+ channels, 339–342
release of, control by blood volume, arterial pressure, and cardiac receptors, 1249–1262
arterial baroreceptors, 1253–1254
atrial receptors, 1252–1253
mediation by atrial and arterial receptors, 1251–1262
other receptors, 1254–1256
relative role of atrial and arterial receptors, 1256–1262
Vertebrates
see also Amphibia; Birds; Mammals
neural cell adhesion molecules in, 819–857

Volume 68—Contents

NO. 1. JANUARY 1988

1 Genetic Aspects of Resistance to Anticancer Drugs
J. R. Warr and G. F. Atkinson

27 Freeze Tolerance in Animals
Kenneth B. Storey and Janet M. Storey

85 Apolipoprotein Genetic Variation and Human Disease
Jan L. Breslow

133 Photorefractoriness in Birds and Comparison with Mammals
T. J. Nicholls, A. R. Goldsmith, and A. Dawson

177 ATP Synthesis by Oxidative Phosphorylation
A. E. Senior

232 Accumulation of Biological Amines into Chromaffin Granules: A Model for Hormone and Neurotransmitter Transport
Robert G. Johnson, Jr.

NO. 2. APRIL 1988

309 Characteristics and Regulatory Mechanisms of the Amiloride-Blockable Na^+ Channel
Haim Garty and Dale J. Benos

374 The Pulmonary Surfactant System: Biochemical Aspects and Functional Significance
Lambert M. G. Van Golde, Joseph J. Batenburg, and Bengt Robertson

456 Regulation of Gastrointestinal Mucosal Growth
Leonard R. Johnson

503 Senescence of Red Blood Cells: Progress and Problems
Margaret R. Clark

555 Inhibin
F. H. De Jong

608 Morphology and Electrophysiology of the Mammalian Atrioventricular Node
Frits L. Meijler and Michiel J. Janse

NO. 3. JULY 1988

649 The Functional States of the Thalamus and the Associated Neuronal Interplay
Mircea Steriade and Rodolfo R. Llinás

743 Factors Involved in the Regulation of Adrenocorticotropic Hormone/β-Lipotropic Hormone
M. T. Jones and B. Gillham

819 Cell Adhesion Molecules in Vertebrate Neural Development
U. Rutishauser and T. M. Jessell

858 The Structure and Function of Cartilage Proteoglycans
S. L. Carney and H. Muir

911 The Renal Handling of Amino Acids and Oligopeptides
Stefan Silbernagl

NO. 4. OCTOBER 1988

1009 **Tuning in the Mammalian Cochlea**
Robert Patuzzi and Donald Robertson
1083 **Production of Inner Ear Fluids**
Olivier Sterkers, Evelyne Ferrary, and Claude Amiel
1129 **Receptor-Mediated Endocytosis and Degradation of Insulin**
Ole Sonne
1197 **Intramembrane Charge Movements in Skeletal Muscle**
C. L.-H. Huang
1248 **Role of Vasopressin in Cardiovascular Regulation**
Leonard Share
1285 **Optical Imaging of Neuronal Activity**
Amiram Grinvald, Ron D. Frostig, Edmund Lieke, and Rina Hildesheim